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ABSTRACT

The specific purposes of this study were to identify new and unique dimensions of teaching and to identify the commonalities of several existing classroom observation systems. The objectives or anticipated outcomes were to; (a) increase interpretation and cross validation of research using different observation systems and more efficient utilization of results of studies using existing systems, (b) reduce the proliferation of overlapping and redundant observation systems, (c) identify a resultant unified or multidimensional category system, and (d) demonstrate the feasibility of engaging in additional factor analytic examinations of other behavioral category systems. Nine systems were selected for factor analysis: Aschner/Gallagher; Flanders; Gallagher; Hough; Medley; Simon/Agazarian; Ober; Schalock; and Withall/Lewis/Newell. Coders trained in the use of these systems were provided with tapes of science lessons for coding in their system. Coders were also asked to make arrangements for key punching and analyzing their own data and to calculate and define those variables that are frequently employed by users of their system. The individual variables for each observation system were factor analyzed. This process provided a list of factor scores for use in a second order factor analysis. The results of the study show that there is a great deal of overlap among the observation systems studied. Appendixes include descriptions of each of the observation systems and instructions to coders. A 50-item bibliography is included. (HMD)

FINAL REPORT

A FACTOR ANALYSIS OF SELECTED CLASSROOM OBSERVATION SYSTEMS

Project No. 2-B-080

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SECTION I -- PROBLEM STATEMENT

1. OVERVIEW:

The problem under investigation is presented in this section along with a rationale justifying its existence. Several aspects of the general problem are considered followed by a statement of general and specific study objectives. Terms used throughout this report which may be misinterpreted are given specific definitions. This section is concluded with a brief statement on the significance of this effort.

2. PROBLEM:

Since the early beginnings of the Office of Education's Cooperative Educational Research Program the proliferation of classroom observation systems to analyze the teaching-learning process has increased at an increasing rate. These observations or category systems are mechanisms for describing and recording social interaction. They generally require an observer to observe and/or listen to two or more individuals interacting and to categorize the interaction according to predetermined notations for verbal and non-verbal behavior. Their use in classroom settings has been primarily a feedback or instructional tool and in many instances used for research purposes.

As the public's concerns for education became more sensitive, so did the researcher's concern for the measurement and description of those teacher and student behaviors that relate to "effective teaching". Many individuals who had ideas about what might constitute the essence of good teaching developed category systems to describe the process of teaching. These efforts to measure and describe teacher behavior led to the large number of observation systems available today.

The publication by Simon and Bowers titled Mirrors for Behavior, demonstrated the growing number of classroom observation systems. This fifteen volume description of approximately 150 category systems for analyzing classroom interaction is intended to help those individuals looking for an instrument to measure a particular type of classroom interaction. However, it clearly exhibits the problems of proliferation.

Some individuals do not see an increase in classroom observation systems as a problem. They view the large number of category systems as vehicles for understanding varied dimensions of teaching. The claim is often heard, and rightfully so, that the process of teaching is multidimensional and not unidimensional. The assumption made by these individuals is that each category or observation system designed and utilized is, in fact, an independent and accurate measure of a unique dimension of teaching.

This study postulates that the above assumption, namely the measurement and/or description of unique dimensions of teaching by each observation systems, is tenuous. Factor analysis is a means for examining this assumption by providing quantitative evidence as to the overlapping nature of categories and observation systems. The multidimensionality of teaching can be examined more accurately if we engage

in activities like factor analysis, to discover those "true" non-overlapping measures of teaching.

The generation of numerous observation systems has made the process of studying teaching more difficult. There are so many different categories of interaction and specification of behaviors that it becomes almost, if not totally, impossible to inter-relate or cross-compare the results of studies that use different observation systems. If a researcher finds "significant" results using several variables calculated from one particular observation system there is no way, except intuitively, of relating his results with findings from other category systems as they are reported in the literature.

Flanders (1970) addresses this issue with the following: "Confidence in reports on teacher effectiveness requires replication, and replication, in turn occurs when qualified researchers are willing to adopt or adapt the same collection procedures. Usually our inability to coordinate separate studies of teaching effectiveness curtails progress in understanding". (Flanders 1970, p. 402)

Another problem created by this proliferation of category systems is that it is becoming increasingly difficult to determine from the maze of variables or categories which of these variables is the most important. Each category system has its own unique set of variables. One observation system may have four variables that correlate with an outcome measure while another category system has five "different" variables related to the same outcome. This study attempted to provide an illustration of factor analysis with the use of observational data as a means for relating the results of studies using varied category systems.

3. PURPOSE OF THIS STUDY

Classroom observation systems are used in research as well as instructional settings. The purposes of this investigation were related to the desire to improve the utilization of classroom observation systems in instruction and research. In general this study attempted to:

1. Identify new and unique dimensions of teaching and
2. Identify the commonalities of several existing observation systems.

These general purposes for this study can be more specifically stated in terms of research objectives or anticipated outcomes.

A. To increase interpretation and cross-validation of research using different observation systems and more efficient utilization of results of studies using existing systems.
B. Reduce the proliferation of overlapping and redundant observation systems.
C. Identify a resultant unified or multidimensional category system.
D. To demonstrate, through pilot test situations, the future value

and feasibility of engaging in additional factor analytic examinations of other behavioral category systems.

The Three objectives stated above were used as guides for this investigation into the overlapping nature of classroom observation systems.

4. DEFINITION OF TERMS:

The following terms are used frequently throughout this report. In order to avoid misinterpretation of concepts a brief definition of specific terms is provided below.

1. Observational system (category system): a structured way of measuring classroom interaction by quantifying observed behaviors into specified categories. Ideally, there is a category which represents every behavior that is observed and each behavior fits into only one category.
2. Interaction Analysis: a specific type of observation system in which the verbal behavior between two or more individuals is categorized and recorded so as to maintain its sequential ordering.
3. Teacher Behavior: the verbal actions a teacher utilized in a classroom environment when interacting with others.

As the number of observation systems has grown, so has the number of classes or "category foci" into which the observation systems can be divided. Currently there are seven classes into which systems can fall. The following is a listing and definition of the domains covered by one or more of the observation systems used in this study.

Affective: A category would fall in this class if its primary focus is on the emotional component of communication, that is, if it takes into account some measure of expression of feeling or emotional overtone of some behavior.

Cognitive: A category would fall in this class if its focus is on the intellectual component of communication.

Psychomotor: A category would fall in this class if its focus is on the description of behavior by which people communicate when they are not using words, for example facial expression or gesture.

Activity: A category would fall in this class if its focus is on recording the activities in which people are engaged, for example reading or writing.

Content: A category would fall in this class if its focus is on what is being talked about, for example administrative routine or content-related material.

Sociological Structure: A category would fall in this class if it supplies a means to determine who is talking to whom, if it designates the role of people, if it notes the number of people interacting, or if it provides information about vital statistics of those interacting, for example gender, race, or age.

Physical Environment: A category system would fall in this class if it

describes the physical space in which the observation is taking place and notes specific materials or equipment being used

Other: A category could fall in this class if its focus does not fit into any of the other classes (From: Mirrors for Behavior, Simon & Boyer, 1970)

5. SIGNIFICANCE OF THIS STUDY

It seems appropriate at this stage of development for classroom observation systems to engage in study which would illuminate the commonalities in numerous category systems in order to be able to:
1) relate results of studies that use different category systems, and
2) clarify variables that are common to numerous observation systems.

Another important reason for engaging in activities to explore possible common factors in various observation systems was that it provided an opportunity to test the feasibility and output of such factor analytic studies. The intent of this study was to examine factors common to many measures derived from category systems with a goal of general insights into new and critical dimensions of teaching behaviors.

SECTION II -- A REVIEW OF RELATED LITERATURE

1. OVERVIEW

Any research study is dependent upon the investigations which have preceded it. The present study is based on two general areas of educational research. The first area includes research studies of the development and use of classroom observation systems. A second area of research includes those investigations which have utilized factor analysis techniques to investigate the dimensions of a classroom.

GENERAL BACKGROUND:

Around 1945 Anderson pioneered in the work of observation systems by distinguishing integrative and dominative teaching behaviors and noting the effects of each on student behavior. By 1949 Withall had developed a system to measure similar classroom behavior--a Social-Emotional Climate Index. Soon Ned Flanders became involved in the study of classroom interaction and the utility of observation systems was demonstrated. An affective measure of classroom interaction analysis has been developed, modified and studied by Flanders from the 1940's to the present. His studies in Minnesota, Michigan and New Zealand have indicated that student behavior, attitude, and achievement can be related to various aspects of teacher behavior, especially to the degree of direct or indirect behavior exhibited by the teacher.

During the last few decades many researchers have developed additional systems for recording classroom behavior: Hough (1967), Gallagher (1966), Schalock (1967), Withall, Lewis & Newell (1961),

Ober (1968), Medley et. al. (1958), Simon & Agazarian (1966), Aschner and Gallagher et. al. (1962). The uses of these systems have been primarily for research, teacher training, and to some extent, for teacher supervision. For example, Aschner and Gallagher used their cognitive system of classroom interaction as a research tool to study the thought processes of gifted children (1963). Hough and Ober have used the Flanders System of Interaction Analysis (FSIA) in the training of teachers (1966). Webb (1970) has used Ober's Reciprocal Category System (RCS) to train supervisory school personnel.

There is no doubt that classroom observation systems are a helpful method to organize our educational thoughts and actions. Unfortunately, in the last few years the growth of category systems have often led to a maze of many categories. Various observation systems have proven reliable and are valid measures of classroom activities. As early as 1967 (Furst) educational researchers have used different observation systems simultaneously to classify classroom behavior. In order to permit greater utilization of results from various studies using numerous category systems the relationships between categories should be established. The process of encouraging coordinated educational research based on observations of classroom behavior could begin with the identification of commonalities and redundancies among classroom observation systems. Many techniques have been suggested to accomplish this task. One such technique is factor analysis.

FACTOR ANALYTIC APPROACHES TO CLASSROOM OBSERVATION

In general, factor analysis is a statistical method of reducing the number of dimensions that appear in a set of variables. This is not a new educational research technique. Hellfritzsch (1945), Schmid (1950), Lamke (1951), Bach (1952), Solomon (1962), and Ryans (1962) all used the technique of factor analysis in attempts to relate various teacher characteristics to teacher effectiveness. Various indices of social adjustment and personality characteristics were used to define teacher characteristics. Scores from student attitude and achievement tests were used as measures of teacher effectiveness. Factor analyses were able to isolate various relations between teacher personality and effectiveness. However, these studies did not use any systematic observation techniques to measure the interaction between teacher and students in the classroom.

In the development of various classroom observation systems, occasional references have been made to factor analysis. For example, while developing the Observation Schedule and Record (OScAR), factor analysis was used to isolate the general dimensions being measured. In one case (Medley and Mitzel, 1958) OScAR observations of forty-nine beginning teachers reduced classroom behavior to Emotional Climate, Verbal Emphasis and Social Structure dimensions. Additional Studies with OScAR have utilized the factor analysis technique in attempts to link this observation system of classroom behavior with supervision methods and ratings (Morrison, 1961; Medley, 1971).

Coats (1966) has used factor analysis of another system to explain and predict student performance. He factor analyzed thirty variables

derived from Flanders System of Interaction Analysis to extract seven orthogonal factors. The orthogonal factors represent the seven independent dimensions of the thirty original variables. Coats then correlated these factors with measures of student attitude and achievement.

Again using Flanders System of Interaction Analysis, Gess performed a factor analysis considering variables based on a 10 x 10 interaction matrix. These reduced to four factors. The strongest factor reflected Flanders' concern with direct and indirect teacher behavior. Similar methodology used by Soar (1966) concluded with different results.

Soar performed factor analyses of a number of variables such as teacher personality, teacher behavior and student performance in order to arrive at information about the essential features of an effective classroom situation. After factor analysis, variables from the Flanders System of Interaction Analysis and The South Carolina Observation Record yielded nine dimensions. The major factor involved teacher criticism. A measure of indirect or direct teacher behavior analogous to that reported by Gess accounted for less variance as evidenced by its isolation as the eighth factor generated. The discrepancy between these findings may result from the different problems under investigation. Gess and Soar both used the factor analysis procedure. However, Gess' analysis was based exclusively on an affective measure of verbal interaction while Soar used a greater variety of observation categories to record verbal and nonverbal behavior. A comparison of these two studies leads one to question whether a factor analysis of the same observations using different variables from numerous category systems would have produced similar discrepancies in identified factors.

In a study by Medley and Hill (1968) Flanders System of Interaction Analysis and OScAR were factor analyzed. Several communalities were reported among the variables from both systems. However, of ten factors extracted from this analysis, one was exclusively based on OScAR and two reflected FSIA categories only. This indicated that the systems do measure some different dimensions. Upon examination of the procedures used in this study one discovers that an attempt was made to make the Flanders variables (matrix cells) independent of each other by removing the "experimental dependence of successive cells." This means that a sequence of behavioral events: 1,2,3,4, would be entered in the following cells: (1,2); (2,3); (3,4); with cells (1,2) and (2,3) sharing the number 2. Instead of using the above protedure Medley and Hill used tallies in cells (1,2) and (3,4) only from the behavioral sequence of 1,2,3,4.

The above procedure may lead to erroneous conclusions because it is contrary to the nature of the analytic technique being employed. The factor analytic technique generates dimensions from recurring relationships between variables. Removing some of these relationships before factor analysis alters the form of these dimensions. The factor analysis procedures utilized were intended to identify the overlapping of communalities in the systems classroom observation. If the overlapping aspects of variables are removed one speculates on the outcomes of the study.

Recently other researchers have experimented with the factor analysis technique to promote the simultaneous use of several classroom

observation measurements in educational research and training. In one study of the multidimensional aspects of classroom interaction (Bane, 1969) one hundred and nine public school teachers were observed by three different observation techniques: Ober's Reciprocal Category System (RCS), the Teacher Practices Observation Record (TPOR) and the Florida Taxonomy of Cognitive Behavior (FTCB).

These three techniques were chosen as representative of humanistic, experimental, and cognitive aspects of classroom behavior. Analyses of Variance, Multiple Regression Analyses and Pearson Product-Moment Correlation techniques revealed that, with the exception of one variable from RCS which was strongly related to one variable from FTCB, the systems did not overlap. The above studies utilized statistical techniques independent of factor analysis and did not identify commonalities among the system. However, another study (Wood, et. al, 1969) which factor analyzed variables derived from the same three systems reflected some overlap within the systems. Variables from the three systems were reduced to twelve factors.

A study involving factor analysis of four classroom observation instruments was performed by Wood and Ober (1969) and Ober (1970). These instruments are the three (The Reciprocal Category System, the Teacher Practices Observation Record, The Florida Taxonomy of Cognitive Behavior) previously sited and a Taxonomy of Imagery Provocation which measures the type of imagery a teacher exhibits. Fifty-three variables from these four measurements were reduced by factor analysis to eleven dimensions. This study demonstrates that it is possible to examine classroom behavior as measured from various systems by examining the factor loadings of each category or variable. The authors were able to characterize the content of each factor by studying the relationships among variables from all four systems.

The general purpose of Wood and Ober's study was to indicate the utility of using more than one observation method to capture the multidimensional nature of the classroom. These authors contended that different observation techniques complement each other. Results from their factor analysis indicate that categories of behavior measured by different techniques are often interrelated and can lead to the development of multifaceted dimensions of classroom behavior. Similarly, the present study has attempted to demonstrate common elements of classroom observation systems in order that the multifaceted dimensions of these measurement techniques may be discovered.

SUMMARY

Organized attempts to measure the behavior occurring in classrooms have resulted in a large number of classroom observation systems. These systems have been used as research tools for various educational investigations. It has been difficult to relate the results of research using one category system with research using other classroom observation techniques. This study has attempted to identify the overlap among several selected classroom observation systems in order to facilitate communication among educational researchers and to demonstrate a

technique and process which may facilitate future inter-relationship of studies.

Some studies involving the simultaneous factor analysis of systems exist, but few are reported in the literature In attempts to demonstrate the multidimensionality of classroom behavior, as many as four classroom observation techniques have been factor analyzed Such studies indicated that variables from various measurements are related. In addition, broad dimensions of classroom behavior can be characterized by a synthesis of variables from different observation techniques

SECTION III -- RESEARCH STRATEGY

1. OVERVIEW:

This section presents the criteria used to select the observation systems employed in this study along with the foci of each system. The intent was to identify systems which are currently being used for research and training purposes and which also possessed certain characteristics which permitted their use in a factor analytic study. The identification and participation of coders for each observation system is discussed along with specific problems encountered.

A description of the behavioral sample and a rationale for its use is provided. The procedures used to disseminate and retrieve data are outlined. The responsibilities undertaken by each coder are presented. Deviations from planned procedures are described along with their consequences. The final part of this section details the analysis procedure employed by this investigation.

2. SELECTION OF OBSERVATION SYSTEMS:

One of the initial tasks undertaken was the selection of observation systems to be used in this study. The intent of this investigation was to provide a basis for the cross-comparison of research efforts using different category systems and to generate insights into new dimensions of teaching behavior. Consistent with these intents was an attempt to identify a limited number of classroom behavioral observation systems that are currently being used for research and training purposes.

An observation system's use in research and training were only two criteria used in selecting the nine systems chosen for this study. Due to the large number of variables generated from each observation system and the amount of time and energy involved in computing these variables it was economically impractical, given the resources available, to use more than nine systems. The process of selecting these nine observation systems involved the specification of criteria beyond their use in research and training settings.

The design of this study called for the coding of classroom observations by individuals highly trained in their use and with demonstrated reliability. This meant that coders with existing skills would have to be found and provided with the classroom interaction to be

analyzed. It was anticipated that coders would be located in disparate geographic locations across the United States. Because of this distance the most efficient means of obtaining the behavioral analysis performed was to send copies of tape recorded lessons to each coder. By necessity, observation systems which could not be used with tape recorded classroom interaction were eliminated from possible use in this study.

Another consideration employed in the selection of observation systems for this research was their ability to collect data about the sequential nature of verbal statements as well as the kind and amount of verbal interaction A sample of observation systems which had category changes and time unit changes and, both category and time unit changes were to be selected for inclusion in this investigation.

A third criteria used in the observation system selection procedure was whether or not the observation technique could be used with any subject matter. (Blumberg, Arthur, "A System for Analyzing Supervision-Teacher Interaction." Syracuse University, Syracuse, N.Y. 1968.) Some category systems are designed to be used for varied specialized purposes. For example Blumberg (1968) has used his system in industrial settings as a vehicle for providing information in a change process. This study would only select those observation systems which were appropriate for use in classroom settings.

Another criteria for selection of observation systems was that the classification system could be used in a classroom setting with three or more individuals interacting verbally. The largest number of observation systems presented in the Mirrors for Behavior anthology are those used for settings in which teacher, pupils and subject matter content is being dealt with. This criteria is consistent with the intent of this study to examine classroom observational systems

The last criteria for selecting category systems was that of using only those systems which are widely known and utilized. A review of the literature in education provided data to determine whether the systems selected are currently in use. One concern was to avoid selecting systems for which no literature exists in either the research or training domains.

The above criteria are summarized in the following list:

1. Behavioral classifications could be made from tape recordings;
2. Categorizations are/or could be based on category or time unit changes;
3. Systems selected could be used with any subject area;
4. Systems use a classroom setting with three or more individuals interacting verbally;
5. Systems are widely known and utilized.

Applying the above criteria to the category systems presented in the Mirrors for Behavior eight systems were selected. In order to examine the non-sequential systems, one observation technique was included which used topic and content changes as the unit of coding. Possible methodologies were explored in an attempt to relate non-sequential data to the information compiled from sequential observation processes.

Table 1 presents the names of selected systems along with domains of each. An examination of Table 1 indicates quite clearly that most of the systems selected deal with either the cognative or affective domains or both. Nearly all the category systems presented by Simon and Boyer (1970) deal with the affective dimension so an effort was made to include systems that dealt with additional dimensions. A description of each category system and the domains covered by each are included in Appendix A of this report.

IDENTIFICATION OF CODERS

In order to locate coders who were both highly trained in the appropriate category system and who had demonstrated reliability, contact was made with the authors of each system. Each author was requested to provide the names, addresses and phone numbers of two coders who possessed both training and reliability in their observation system. Authors responded with the names of possible coders. Requests to participate in the current research effort required a phone call to possible coders. Each coder was given a brief description of the overall project, its associated time line and the amount of dollars available for coding purposes. Their part in the study was explained to them and in most cases the first person contacted agreed to participate by coding taped classroom teaching episodes using the system for which they were uniquely trained. In some instances individual authors and coders were extremely difficult to locate. A persistent effort managed to identify, contact and secure cooperation from all potential coders.

Once coders agreed to participate, they were sent materials describing the study and the tasks they were to complete (See Appendix B). Several coders requested that the research staff provide additional assistance in completing their efforts. This assistance ranged from simply providing more time to complete their tasks to doing the data processing and analysis of the variables from their observation system. The additional assistance provided, required the time consuming process of writing and debugging computer programs to compile and analyze data.

3. BEHAVIOR SAMPLES:

In order to perform a factor analysis of several classroom observation systems it was necessary to identify and locate a sample of behavioral events that could be coded using all the category systems. These behavioral events would have to be taped classroom teaching episodes. The Science Teaching program at Syracuse University maintained files of classroom performance of science teachers involved in their program. With the assistance and consent of Dr. John Schaff of Syracuse University, a sample of 50 science lessons were obtained for use in this study. These science lessons were used for several reasons. First, their use controlled for influences due to the subject and grade level being taught. The results from the studies by Gess (1968) and Soar (1966) suggest that controlling for grade level would be important for an accurate factoral description of overlapping categories.

TABLE 1

The Focus of the Observation Systems
Selected for Factor Analysis

	DOMAINS (FOCUS)							
	Affective	Cognitive	Psychomotor	Procedure or Routine content	Sociological Structure	Physical Environment	Activity	Other
Aschner/Gallagher		X		X			X	
Flanders	X							
Gallagher*		X					X	
Hough	X						X	
Medley	X	X		X				
Simon/Agazarian	X	X				X		
Ober	X							
Schalock	X	X	X	X	X	X	X	
Withall/Lewis/Newell	X	X						

*nonsequential analysis

Secondly, the availability of tapes represented a considerable saving of time and the additional expense of recording classroom sessions.

4. PROCEDURES:

The information sent to coders about this research effort and the specific activities they were to be involved in during this study contained a format for the return of data. Each coder was requested to return any worksheets, tally sheets or coding forms used in quantifying the behavioral events contained on each tape recorded lesson. The coders were provided with a form on which they were to list the variable names for their system across the top and insert the values calculated for each variable along the row associated with the appropriate taped lesson. This format for returning information would facilitate the keypunching of this data onto hollerith cards (See Appendix B).

Each classroom episode was listened to and an assessment of audio quality was performed. Those tapes that were not clearly audible were discarded for others which were clear of any distortions. The tapes selected were labeled sequentially and nine additional copies of each tape were made and labeled. A coding form and an instruction sheet were mailed to each coder along with a complete set of 50 tape recorded lessons.

CODER RESPONSIBILITIES

The individuals identified as coders of the taped classroom episode agreed to perform and complete several tasks.

1. Code Tapes: Every coder was supplied with tapes and coding sheets and instructed to code each lesson. Each tape was fifteen minutes in duration and one lesson was presented on each side of a 30 minute cassette tape. The coders in prior conversations all indicated that they had access to a cassette tape recorder.
2. Keypunching: Since the processing of observational data involves large bits of information in the form of tallies within categories, it was expected that computers would be used to process this data. Each coder was to make his own arrangements regarding keypunching tasks.
3. Analyze/Produce Variables: Similar to the coders responsibilities for keypunching was their obligation to process their data using their own existing or developed programs to produce the variables generally calculated from their observation systems. it seemed quite unreasonable for this research staff to develop all of these computer programs or try to make existing programs operational on available facilities. Coders were requested to calculate and define those variables that are frequently employed by users of their system.
4. Return of Materials: Coders were responsible for returning the row tallies, coding forms for variable listings, and an interpretation of all variables identified for use in this

study. These materials were to be returned to Syracuse University within approxfmately 60 days of their receipt.

5. Variance from outlined plan: Coders began to request changes in the established procedures. For example, one coder requested that keypunch and other assistance be provided since her system involved more time to code than others Her system involved five times the amount of time required of other systems to code each lesson. For this reason the research staff agreed to keypunch and develop the computer software necessary to process her data (a time consuming and involved process).

Another problem encountered which caused deviation from the appointed schedule was the lack of data processing facilities for several coders. Three coders requested key-punching services; two required computer processing including program debugging; and one necessitated program writing, debugging and processing of their coded data. All of the above activities were to be the responsibility of the coder but for various legitimate reasons they could not be fulfilled.

In the process of high speed reproduction of tapes one blank tape was sent to a coder. This caused an additional delay in that coder's return of materials. The general problem of time delay was mainly due to the total dependence of the research staff on coders located across the country. The problems of communication were time consuming and frustrating.

5. ANALYSIS

The general intent of this study was to examine the overlap in classroom observation systems. The Medley and Hill (1968) study outlined in Section II presents some of the problems to be dealt with when working with observation data in factor analysis context.

Factor analysis is not an end in itself but is rather a technique which can help us to acquire a better understanding of the empirical world. The purpose for using this procedure was to find the appropriate number of independent dimensions necessary to adequately describe the phenomenon of teacher behavior.

The individual variables for each category or observation system were factor analyzed to determine the extent to which variables load together on similar factors. This process provided a listing of Factor Scores (standardized scores) based on the factor loadings for each lesson. These factor scores were used to perform a second order factor analysis. This meant that the number of variables inputed into the first factor analysis was summarized in terms of standardized scores for each factor generated These standardized scores became the input for a second factor analysis.

Soar (1966) has indicated problems with using second order factor analysis. In personal discussions it was indicated that his problems may be attributable to the heterogeneity of his data. He used data from K-9 grades in settings ranging from traditional classrooms to open educational programs. Since the data used for this study is homogeneous in terms of the above variables, Soar thought that the second order

factor analysis approach seemed appropriate.

Existing computer programs and options, specifically those included in the Biomedical Computer Programs were utilized by this study. These analysis procedures permitted principle axis as well as varimax rotation solutions. Factor scores were also generated from options included in the computer package.

SECTION IV - FIRST ORDER FACTOR ANALYSIS

This section presents the results of the first order factor analysis along with a discussion of the factor descriptors. These first order factor analyses are detailed here to provide the reader with an understanding of the concepts used for the second order factor analysis.

A principle components solution was computed along with a varimax rotation yielding only those factors with an eigenvalue of 1.0 or greater. This criteria yielded satisfactory solutions in some cases but in order to find the most suitable solution based on the requirement of broad, interpretable factors, additional factor solutions were generated. An attempt was made to include more than 60% of the variance in each set of factors for each category system used. Each attempt at factor resolution is presented along with the description of the factor solution.

The following observation systems are presented along with a description of their factor components.

Withall
Ober (RCS)
Aschner-Gallagher
Flanders (FSIA)
Medley (OScAR 5V)
Hough
Schalock (TR)
Gallagher
Simon-Agazarian (SAVI)

1. WITHALL CATEGORY SYSTEM

An examination of the first order rotated factor matrix for the Withall category system indicates that five factors were generated from the original fourteen variables. The eigenvalue of 1.0 stopping criterion was used along with several other criterion levels. The 1.0 value provided what was considered to be a meaningful factor solution for the Withall system. These five factors accounted for 64 percent of the total variance in the fourteen variables. Variables with factor loadings of .53 or greater were used for interpretive purposes. This value of .53 was selected because it was the minimum value at which the variables did not overlap on the factor scales. Additional variables were used when it was necessary to get meaning from a particular factor. Meaning was derived from all factor loadings but only the high loadings are presented in the tables. Factor I accounts for 19% of the variance in the fourteen variables and consists of four variables above the selected criterion level. Table 2 presents the variable number the factor loading and the description of each variable.

TABLE 2

Factor I - Directing the communication processes

Variable number	Variable description	Factor loading
1	asks for information	.636
7	gives direction	.539
9	gives analysis	-.701
11	inhibits communication	-.680

In this factor there is a greater deal of control or managing of the communication in the classroom. By asking for information the teacher is engaged in the process of eliciting responses from the student. These responses will presumably be evaluated for accuracy either by comparison to an objective independent criteria or general acceptance. Likewise variable number 7 explicitly indicates that direction is given to structure some action, with compliance as a given.

Variable 9 is loaded negatively which means that giving analysis is interpreted as not providing analysis. By analysis is meant the provision of explanations with the implication that there is a "correct" view of whatever is being discussed. The lack of elaboration could be another descriptor of this variable's contribution to Factor I. The negative sign for the factor loading on "Inhibits Communication" likewise requires a reversal of interpretation for that variable. Here the teacher would show a willingness to engage in the process of communication. An interest in what's going on

would be characteristic of this variable's use.

The clustering of these four variables might be best described by the teacher's desire to direct the communication processes in the classroom.

Factor II consists of three variables clustered around what might be considered as "problem structuring" or the initiation of inquiry (Table 3). It accounts for 14% of the variance in the set of fourteen variables.

TABLE 3

Factor II - Problem Structuring behaviors

Variable number	Variable description	Factor loading
3	Asks for opinion or analysis	.697
6	Gives suggestions	-.694
14	Perfunctory Agreement or disagreement	.711

"Asking for opinion or analysis" related very directly to what is typically reported as inquiry behaviors. Here the teacher is trying to elicit problem-structuring statements from the students. In doing this, the teacher does not want to structure the actions of the students or offer alternatives (variable number 6). By perfunctorily agreeing or disagreeing with what students say the teacher intends to foster student inquiry.

Factor III consists of 3 variables which account for approximately 12% of the variance (Table 4).

TABLE 4

Factor III - Learner supportive behaviors

Variable number	Variable description	Factor loading
8	Gives opinion	.766
10	Shows positive feelings	.583
13	No communication	-.761

The variables loading high on this factor indicate that the teacher is supporting student learning by showing positive feelings and giving opinions that might or might not be accepted by the student. The high negative factor loading on "no communication" means that the teacher does not inhibit communication but actually encourages it. This encouragement dimension is consistent with showing positive feelings and giving opinions. It seems reasonable

to call this cluster of variables "learner supportive" in that effort, on the part of the teacher to encourage or support the learner in his efforts and activities, is expended.

The fourth factor generated accounted for 10% of the variance in the fourteen variables. Table 5 presents the four variables with their respective factor loadings.

TABLE 5

Factor IV - Teacher disapproval or dominance

Variable number	Variable description	Factor loading
2	Seeks or accepts direction	.625
7	Gives direction	.527
12	Shows negative feelings	.787
14	Perfunctory Agreement or disagreement	.468

In this factor the teacher is admonishing the student for inappropriate or unacceptable behaviors and by giving direction the intent is to impress on the learner the fact that he or she has not met the teacher's acceptable criteria. An adequate discriptor of this factor might be "teacher disapproval or dominance."

Factor V accounts for 9% of the variance in the set of scores and has only two items with factor loadings of .53 or longer (Table 6).

TABLE 6

Factor V - Provision of information

Variable number	Variable description	Factor loading
4	Teacher listening	-.605
5	Gives information	.870

This factor clearly indicates that the teacher is giving information to the student but is not listening to what may be going on in the classroom. The provision of information on the part of the teacher seems to be the best descriptor of this factor.

2. OBER - RECIPROCAL CATEGORY SYSTEM (RCS)

A first order factor analysis of twenty variables from the Reciprocal Category System (RCS) extracted five factors which accounted for 66% of the total variance. An eigenvalue criterion of 1.0 provided a meaningful solution for this factor analysis.

Factor I accounted for 25% of the total variance. Table 7 presents the variables which loaded high in relation to this factor.

TABLE 7

Factor I - Teacher Encouragement of Content Oriented Interaction

Variable number	Variable description	Factor loading
2	Teacher accepts behavior of another	.661
3	Teacher amplifies contribution of another	.830
4	Teacher elicits information	.615
6	Teacher initiates, presents information or opinions	-.840
15	Student responds	.762
16	Student initiates, presents information or opinions	.634
20	Teacher talk (percent)	.909

This factor describes a situation in which the teacher and student interact about content and subject matter. Factor I is characterized by little teacher talk (variable 20) in general and in particular little lecturing by the teacher (variable 6). When the teacher does speak, it is to positively reinforce the student (variable 2), add to another's ideas (variable 3) or to draw out a response from a student (variable 4). These behaviors indicate teacher encouragement of student participation. Variables 15 and 16 indicate that the student responds in this type of environment and even initiates new ideas.

Factor II accounts for 14% of the total variance. Table 8 presents variables which load high in relation to this factor.

TABLE 8

Factor II - Student and Teacher modification of inappropriate behaviors

Variable number	Variable description	Factor loading
8	Teacher corrects	.440
9	Teacher "cools" (formalizes) the climate	.629
13	Student amplifies contribution of another	.787
19	Student "cools" (formalizes) the climate	.818

Two similar variables, number 9 and number 19, provide the basis for this factor's description. "Cooling" or formalizing the climate means that statements are used to change inappropriate behaviors. The loading of variable 8 (teacher corrects) with this factor strengthens the notion of behavior modification. In addition, variable 13 indicates that students do abide by attempts to change their behavior. That is, students will amplify and use the suggestions of others; especially those statements intended to modify behavior.

Factor III accounts for 10% of the total variance. This factor is described as one with the Student Controlling Behaviors. This is substantiated by the high loadings of variables 17 and 18 (Student directing behaviors and student correcting behaviors). In addition, consistently low loadings on the variables relating to teacher talk indicate that variables or codings of teacher behavior are relatively unimportant to the structure of this factor. Table 9 provides some of the variables' loadings in relation to this factor.

A fourth factor accounts for 9% of the total variance. Table 10 presents some loadings from factor IV.

This factor is characterized as a dimension for teacher directing behaviors. Variable 7 (Teacher directs) indicates that the teacher is giving orders to the students and the teacher expects something to be done. The teacher is not transmitting information about subject matter (negative loading of variable 6). Rather the teacher wants a definite activity to occur. The high loading on variable 10 may be evidence of the students' complying with the teacher's instructions. For example, silence could follow a teacher's order to read or write an assignment. Or, noises of confusion might often accompany a teacher's order to start a new activity.

TABLE 9

Factor III - Pupil controlling behaviors

Variable number	Variable description	Factor loading
1	Teacher "warms" (informalizes) climate	-.052
3	Teacher amplifies contributions of another	.046
5	Teacher responds	.062
7	Teacher directs	-.123
9	Teacher "cools" (formalizes) climate	-.066
17	Student directs	.875
18	Student corrects	.866

TABLE 10

Factor IV - Teacher directing

Variable number	Variable description	Factor loading
6	Teacher initiates (presents information or opinions)	-.428
7	Teacher directs	.744
10	Silence or confusion	.906

A final factor of Student-Teacher warmth and acceptance accounted for 8% of the total variance. Variables 1, 11, and 12 clustered together and helped to describe this factor. Both teacher and students made attempts to "warm" the emotional climate of the classroom. In addition students accepted these attempts to make the classroom emotionally friendly (variable 12). Variables 1 and 11 also specifically include verbalizations which express feelings or emotional responses. Table 11 presents the three variables which load most highly in relation to factor V.

TABLE 11

Factor V - Student-Teacher warmth and acceptance

Variable number	Variable description	Factor loading
1	Teacher "warms" (informalizes) climate	.718
11	Student "warms" (informalizes) climate	.775
12	Student accepts behavior of another	.737

3. ASCHNER-GALLAGHER SYSTEM

First order factor analysis reduced twenty-nine variables from the Aschner-Gallagher classroom observation system to five factors which account for 49% of the total variance. An eigenvalue of 1.0 provided a meaningful solution for this factor analysis even though all factors generated did not add to the interpretation.

Factor I accounts for 15% of the variance in the twenty-nine variables. This factor is characterized as one with the teacher directing academic behavior. Table 12 presents information about variables which load highly with respect to this factor.

TABLE 12

Factor I - Teacher directing academic behavior

Variable number	Variable description	Factor loading
7	Structuring others	.957
9	Class structuring	.622
20	Clarifying meaning	.893
21	Clarifying qualification	.944
84	Generalization conclusion	.840

Variables 7 and 9 are examples of routine structuring behaviors. Specifically the teacher is trying to guide the discussions and actions in progress or is attempting to focus attention on new material. Variables 20 and 21 are examples of what Aschner and Gallagher call cognitive-memory operations. Specifically variables 20 and 21 indicate that content oriented statements are being amplified. Variable 27 is an example of what Aschner and Gallagher call a convergent thinking operation. In this case, there is a general summary of previous subject matter.

Factor II accounts for 11% of the variance and is characterized as a factor of chastisement. Table 13 presents variables which load highly with respect to this factor.

Variables 11, 14, and 16 are all categories which Aschner and Gallagher have clustered together as part of routine verdict giving interaction. It appears that students' attempts at humor and students' admitting they do not know information result in reproach from the teacher. Additionally, a more general category (number 5) for feedback loads with this set of chastizing behaviors.

A third factor of structuring behaviors accounts for 9% of the total variance. Table 14 contains the variables which load highly in relation to this factor.

TABLE 13

Factor II - Chastisement

Variable number	Variable description	Factor loading
5	Feedback	.340
11	Negative verdict on academic performance	.780
14	Dunno	.700
16	Humor	.770

TABLE 14

Factor III - Structuring

Variable number	Variable description	Factor loading
2	Procedure	.986
8	Future structuring	.986
9	Class structuring	.623

These three variables are part of what Aschner and Gallagher have called routine procedural behaviors. Specifically it appears that the teacher is providing information about immediate tasks for the student (variables 2 and 9). Additionally the teacher may be revealing future activities. The essential focus of this factor is that of structuring student behaviors.

A fourth factor, one of content repetition, accounts for an additional 9% of total variance. Table 15 includes those variables which load highly in relation to this factor.

TABLE 15

Factor IV - Content repetition

Variable number	Variable description	Factor loading
12	Acceptance of content (agreement)	.840
17	Scribe	.757
18	Repetition	.706

Variables 17 and 18 belong to that set of behaviors which Aschner and Gallagher have characterized as cognitive-memory operations. Specifically, variables 17 and 18 indicate that students are closely restating content matter. The Scribe (number 17) variable indicates the student may additionally be presenting a written or oral example of whatever facts or formulas are being covered in class.

Not surprisingly, these types of student recitations load highly with teacher acceptance of content. The student reiterates or restates facts or figures previously stated and the teacher agrees that the content is correct.

A fifth factor for providing factual explanation accounts for 6% of the total variance. Table 16 indicates variables which load together on this factor.

TABLE 16

Factor V - Providing factual explanation

Variable number	Variable description	Factor loading
1	Questions	-.418
25	Rational explanation	.800
5	Feedback	.503

These variables in conjunction with low loadings on many routine procedure variables describe an atmosphere in which the teacher and student interact in order to explain factual matter. The negative loading on variable 1 indicates the situation in which a teacher is not requesting that students pose questions. Rather a rational explanation is being made (variable 25) and some sign of understanding from the students (variable 5) is expected.

4. FLANDERS - SYSTEM OF INTERACTION ANALYSIS

In an attempt to identify meaningful factor solutions several rotated matrices were generated. Forty-one variables were identified as those used by the Flanders system of interaction analysis. An initial rotated factor matrix for these forty-one variables provided what seemed to be meaningful factors. Due to the overlapping procedure for calculating variables for this system it was decided to run only the column totals for each of the Flanders 10 categories. The factor solution did not provide what might be considered an adequate solution. In addition to not having meaning the use of only the 10 categories in the Flanders system eliminates many variables frequently used by researchers.

The eigenvalue of 1.0 stopping criterion was used with the forty-one variables. This value permitted the generation of 10 factors from the original forty-one variables. Four of these ten factors had apparent meaning and accounted for 64% of the total variance in the forty-one variables used.

Factor I accounts for 28% of the variance in the forty-one variables and consists of 9 variables. Table 17 presents the variable number, the name of each variable, and the factor loading.

TABLE 17

Factor I - Teacher supportive behaviors

Variable number	Variable description	Factor loading
20	col 3	-.933
25	col 8	-.830
39	FLEXM	-.802
41	AMT3	-.934
6	TT814/TT857	-.679
4	TT14/TT57	-.546
5	TT813/TT867	-.569
21	col 4	-.572
38	AMT4	-.572

Due to the way variables are calculated from the Flanders matrix there is a great deal of overlapping of variables. This is quite evident in Factor I. All of these variables deal with teacher acceptance of student ideas and asking questions. The ratio variables (4, 5, and 6) also deal with acceptance of student feelings, ideas, and use of questions as they relate to lecturing, giving directions and criticising. When the overlap of variables is taken into account this factor can best be described as teacher supportive

behaviors. These would be behaviors a teacher uses to encourage support and use student responses.

Factor II contains variables that relate directly to the student's initiation of communication. Five variables are presented in factor II which accounts for 15% of the variance (Table 18).

TABLE 18

Factor II - Student initiation

Variable number	Variable description	Factor loading
1	Student talk	.848
17	EXTST	.853
26	Col 9	.904
32	AMS9	.904
37	C99	.918

Again the overlap in the variables presents a somewhat loaded picture of student talk. It is clear, however, that this student talk is related to student initiation as opposed to student response. Variable number 25 (student response) loads very low on this factor (factor loading .161) along with other variables that use the student response variable. This indicates that possibly teachers are using behaviors which encourage student initiation of the communication process as well as extending it (variable 17).

Thirteen percent of the variance in the forty-one variables is accounted for in Factor III. Table 19 presents the eight variables loading high on the third factor.

TABLE 19

Factor III - Teacher monitoring

Variable number	Variable description	Factor loading
2	Teacher talk	-.908
14	CRUX	-.878
22	Col 5	-.779
27	Col 10	.898
33	AMT10	.898
36	C55	-.819
19	Col 2	.428
34	AMT2	.427

This factor suggests that silence or confusion is a prevailing theme. The teacher is not talking or lecturing (variable 2, 14, 22 and 36) to a great degree but when the teacher says something it is generally "praise" (variable 19). This factor indicates that very little communication is occurring (variable 27) and suggests that the teacher is monitoring classroom activities. Students are being praised but are not involved directly in responding to or initiating communication. The fact that praise also loads on this factor suggests that this factor be called teacher monitoring as opposed to total silence or confusion.

Factor IV accounts for 8% of the variance in the set of scores. Four variables loaded high on this factor which is described as "Teacher rejection of student ideas."

TABLE 20

Factor IV - Teacher rejection of student ideas

Variable number	Variable description	Factor loading
9	RID89	-.787
29	EX33	-.896
30	EX33F	-.903
7	TT913/TT967	-.899

The high negative loadings on these four variables presents a dimension of classroom interaction that might be described as teacher rejection of student ideas. Variable 9 represents what a teacher says after a student stops talking and is directly related to variable 7. These high negative loadings indicate that the teacher tends to be non-accepting of student ideas, does not use them to further develop the material being covered and does not praise students a great deal when compared to the teacher's use of lecture, direction and criticism following student talk. The factor can best be described as teacher non-acceptance, or its inverse, rejection of student ideas.

5. HOUGH SYSTEM OF INTERACTION ANALYSIS

Using a 1.0 eigenvalue criterion for determining the number of factors to be generated, the rotated factor matrix contained four meaningful variables which together accounted for 52% of the variance in the total set of scores. Twenty-seven variables were used in the first order factor analysis of the Hough System.

Factor I accounted for 25% of the variance in the twenty-seven variables from the Hough observation system. Table 21 provides the variable descriptors and the factor loadings for each variable loading high on Factor I.

TABLE 21

Factor I - Teacher and student managerial

Variable number	Variable description	Factor loading
2	Teacher direct managerial	-.749
4	Student direct managerial	-.789
6	Teacher interactive managerial	-.914
8	Student interactive managerial	-.773
24	Teacher substantive/ managerial	.822
26	Student substantive/ managerial	.856
27	Total substantive/ managerial	.935

Items 2, 4, 6, and 8 have high negative factor loadings indicating they have something in common with each other and that what it is that is common is also conceptually the inverse of items 24, 26, and 27. It seems that the first four items are related to the dimension of non "managerial" functions while the other items tend toward the dimension of "substantive." This might mean that this factor is getting at the non-managerial function in the classroom.

This "non-managerial" factor can also be described as a concern for managerial functions. When all seven items in Factor I express a concern for managerial issues this factor might best be described as teacher and student managerial.

The second factor generated from the rotated factor matrix accounted for 17% of the variance in the twenty-seven Hough variables. Factor II

consists of four variables that have loadings above .60 (Table 22).

TABLE 22

Factor II - Teacher substantive interaction

Variable number	Variable description	Factor loading
5	Teacher interactive substantive	.602
7	Student interactive substantive	-.869
22	Substantive response/ initiatory behavior in teacher response	-.861
23	Substantive response/ initiatory behavior in student response	.739

Variable number 23 refers to the teacher giving substantive responses more frequently than the student giving initiatory behaviors in his response. This relates directly to the teachers engaged in substantive interaction (variable number 5). The inverses of the above are described in variables 7 and 22, namely the student not involved in substantive interaction and the student not giving substantive responses more frequently than the teacher giving initiatory responses.

Factor III consists of four variables and accounts for 10% of the total variances in the 27 variables generated from the Hough category system. Table 23 presents the variable descriptors and their respective factor loadings.

TABLE 23

Factor III - Discipline

Variable number	Variable description	Factor loading
9	Static or noise	.816
11	i/d ratio	-.728
15	i/d in teacher response	-.729
18	Ratio of appraisal negative to positive	.885

The i/d ratios (variables 11 and 15) indicate the amount of teacher acceptance compared to her directive behaviors. The high negative factor loadings indicate that the teacher is directive in the classroom setting. The combination of the use of negative and positive appraisal with the variable of static or noise seem to indicate that this dimension might be concerned with discipline. The teacher is making appraisals in a static or noise situation while also being directive. This set of conditions might best be described as a dimension of "discipline."

6. MEDLEY - OScAR 5V

In reviewing the literature related to OScAR it is clear that much has been done to identify and isolate orthogonal factors. When variables and their descriptions were requested from the coder of the OScAR tapes a response was received which indicated that the variables were determined to be orthogonal. In an attempt to form a factor solution to replicate the orthogonality of the eight variables received, a factor analysis was performed specifying eight factors to be rotated. The expectation was that each factor would have one dimension clearly visible. When this factor analysis was performed no meaningful resolution was found which would account for the original eight variables (see appendix F).

Using an orthogonal rotation of factor analysis with an eigenvalue criterion of 1.0, four factors were generated from the eight variables (indices) specified as being used in OScAR 5V category system. These four factors account for 70% of the total variance. For this system the minimum value at which the variables did not overlap on the factor scales was .47. All of the factor loadings for each factor were examined to conceptually define the nature of each factor.

Factor I accounted for 23% of the variance in the total set of eight variables. Table 24 presents the factor loadings for those variables loading high on Factor I.

TABLE 24

Factor I - Teacher encouraging elaboration

Variable number	Variable description	Factor loading
1	Managing behaviors	-.470
7	Question quality	-.519
8	Listening behaivor	.795

The scoring of these variables makes interpretation more difficult for factor analyzed scales. Variable number 8 has a high positive loading indicating that the teacher is listening a great deal to students. This is consistent with the low factor loading (-.470) for managing behaviors. This means that the teacher is not telling the students what to do but is listening. The high negative loading of -.519 on question quality means that the teacher is asking elaborating questions of students and rarely evaluates the students' responses. This seems to suggest a dimension of encouraging students to think and elaborate on what was just said. Elaboration by the student is consistent with teacher listening and not telling students what to do.

Factor II consists of two highly loaded variables which account for nineteen percent of the variance (Table 25).

TABLE 25

Factor II - Student initiation

Variable number	Variable description	Factor loading
2	Question source	.822
4	Question difficulty	.808

At first glance this factor seems to get at the dimension of questions in a classroom setting. If one examines the interpretation of these variables (see appendix F) it becomes evident that "questions" are just one aspect of this dimension. A high negative mean for variable four indicates that the teacher uses questions that get many varied responses from the student. This is consistent with a high positive factor loading for variable 2 (.822). Variable 2 implies student initiation of ideas, comments, concerns, etc., with the teacher accepting them without evaluation.

The descriptor of "student initiation was chosen because it reflects the freedom in the class for students to initiate their own ideas without fear of sanctions.

A third factor consisted of three variables which loaded high. This factor accounts for 13% of the variance accounted for by the total set of 8 OScAR 5V scores. The factor loadings and variable descriptions are provided in Table 26.

TABLE 26

Factor III - Teacher Authoritarianism

Variable number	Variable description	Factor loading
1	Managing behaviors	.412
4	Permissive behaviors	-.678
5	Rebuking behaviors	-.729

The factor loading of .412 on the variable "managing behaviors" means that the teacher is telling students what to do. This is consistent with the high negative factor loading on the variable "permissive behaviors." The teacher is refusing students a choice of action when the student requests which is typical of an autocratic teacher. In addition to being not permissive and telling students what to do the teacher does not criticize. This lack of criticism is probably a reflection of the autocratic having complete control over the classroom situation.

Factor IV accounts for 13% of the variance in the eight variables from OScAR 5V system. Table 27 presents the variable numbers, the variable descriptions and the factor loadings for Factor IV.

TABLE 27

Factor IV - Teacher control of interaction

Variable number	Variable description	Factor loading
1	Managing behaviors	.635
3	Lecturing behaviors	-.857

The high positive mean score for the variable of teacher lecturing behaviors along with a high negative factor loading indicates that the teacher is interacting with many students. A high positive factor loading on "managing behaviors" can be interpreted as the teacher being directive or telling students to do, or not to do something. These procedural directives along with a great deal of interaction implies that this dimension is the teacher's control of classroom interaction.

7. SCHALOCK - TEACHING RESEARCH SYSTEM (T-R)

The Teaching Research System for classifying teacher pupil interaction was selected because it was reported to measure not only cognitive and affective classroom consideration but also psychomotor, activity, procedure or routine content, sociological structure as well as physical environment. When the data were returned, 166 variables were identified. Since there were only 50 classroom episodes it was decided not to compromise the second order factor analysis by using first order factors that were unreliable. The factors generated using 166 variables and only 50 cases are certainly to be unreliable.

When the coder was asked which variables were "generally" used by researchers for studies of teacher behavior, his response indicated that all of the variables were used. He also commented that with only fifteen minutes of observation the variables would also be unreliable. For these two reasons the Schalock variables were not included in the second order factor analysis.

A complete list of categories used by the Teaching Research System can be found in Section 69 of Mirrors for Behavior (summary) by Simon and Boyer, 1970.

8. GALLAGHER TOPIC CLASSIFICATION SYSTEM

In an effort to elicit data on a category system which examines the content of the classroom interaction, an attempt to use the Gallagher Topic Classification System was made This system codes behaviors of the teacher and pupils into content, skill and style categories. This system was not included in the final analysis because the topics or content areas dealt with varied from tape to tape. The lack of commonality in topics across tapes eliminated the use of factor analysis with this system.

The codes are:

1 - Content
2 - Skills

0 - No determinable level (undeveloped topic)
1 - Data
2 - Concept
3 - Generalization

0 - No determinable style (undeveloped topic)
1 - Description
2 - Explanation
3 - Evaluation - Justification
4 - Evaluation - Matching
5 - Expansion
6 - Activity
7 - Structuring

9. SIMON AND AGAZARIAN: SEQUENTIAL ANALYSIS OF VERBAL INTERACTION (SAVI)

An examination of the first order rotated factor matrix for the SAVI category system indicates that four factors were generated from the twenty-five original variables. An eigenvalue of 1.0 stopping criterion was used to generate eight factors. Only four factors accounted for 47% of the total variance in the twenty-five variables.

Factor I consists of seven items with high factor loadings. This factor accounted for 35% of the variance in the twenty-five variables calculated from Sequential Analysis of Verbal Interaction (SAVI) system for categories classroom interaction.

TABLE 28

Factor I - Concern for topic

Variable number	Variable description	Factor loading
8	Topic questions	-.877
10	Positive reinforcement	-.788
14	Noise	-.638
17	Command	-.663
21	Response Narrow	-.781
22	Response Broad	-.789
25	Topic Reflection	-.864

An examination of the definitions listed in the Appendix for each of these variables indicates they all relate to what might be described as a concern for the topic under consideration. From the variables that load on this factor it seems that dealing with non-personal questions and getting responses which are either broad or narrow indicates communication of a topic or content. The variable "topic reflection" indicates paraphrasing of responses, another concern for topic.

Also loading on this factor is the use of statements which encourage (variable 10) or indicates that what has been said has been heard. The high loadings on "noise" and "command" might relate to the control of behavior to permit a concern for topic.

The second factor generated from the twenty-five SAVI variables accounted for 8% of the variance in the total set of scores. Table 29 presents the four variables with high factor loadings.

If variable number 4 is interpreted as merely jargon not shared by the group the remaining variables constitute what might be considered a concern for acceptance. The high factor loading on "topic build" implies the building on another's ideas which also implies agreement with the thoughts of others. A concern for supporting others is also included in variable 20, "maintenance joke." Variable 7 indicates that

TABLE 29

Factor II - Concern for acceptance

Variable number	Variable description	Factor loading
4	Intellectualization	.784
7	Description	.525
20	Maintenance Joke	.741
24	Topic build	.754

descriptions of objects, activities, behaviors or thinking is being dealt with. Taken collectively these variables seem to be related to the issue of group acceptance.

Factor III accounted for 7% of the total variance. Table 30 presents the variables that loaded high in relation to this factor.

TABLE 30

Factor III - Neutral assertion

Variable number	Variable description	Factor loading
3	Everybody ought	-.609
13	Quiet	.541
19	Self affirming	-.770

This factor describes a situation in which the teacher is neither making dogmatic value judgements about what everybody ought to do nor making statements of a self-declarative nature to support himself. The high positive loading on the variable "quiet" in combination with variables 3 and 19 indicate a rather neutral state of affairs. The teacher is neither approaching or avoiding in terms of the SAVI category system. It seems that this dimension of "neutral assertion" is primarily concerned with personal information, that which influences interpersonal relationships, rather than topic, the material for problem solving.

The fourth factor generated from the twenty-five SAVI variables accounted for an additional 7% of the variance in the set of scores. Table 31 presents the two variables loading on this factor along with their descriptors and factor loadings.

Both of these variables load highly negative meaning that their interpretation might be no hostility and no laughter. It seems more

TABLE 31

Factor IV - Criticism

Variable number	Variable description	Factor loading
2	Hostile	-.857
15	Laughter	-.849

reasonable to view a dimension in which the hostility is expressed as negative criticism of others, of direct verbal attacks and sarcastic opinions and questions. Along with this negative expression might be the use of laughter by the group as a tension release.

Another view of this same dimension is that the teacher has no control over the class and that laughter is occurring. Hostility is used by the teacher in an attempt to bring about order. Whichever interpretation is used the dimension under consideration seems to be that of "Criticism."

SECTION V - SECOND-ORDER FACTOR ANALYSIS AND DISCUSSION

The first-order factor analyses provide for the description of factors identified from observation systems. These factors were described and discussed in Section IV in order that a conceptual description could be associated with those variables with high loadings on that factor. These descriptors provided a manageable title for each factor to be used in the second-order factor analysis. All of the variables for a factor identified as meaningful and useable were converted to standarized factor scores. These factor scores became the input for the second-order factor analysis.

The descriptors given to each factor are not without error. The fact that a factor is called "criticism" is not to imply that it might not be called "hostility." The selection of the descriptors were the authors' best understandings about what each of the variables contributed to some common concept. In order to reduce possibilities of misinterpretation due to inaccurate descriptors of first-order factors, the first-order variables were examined as definition of second-order factors progressed.

A first attempt at second-order factor solution was performed with an eigenvalue of 1.0 or greater. This solution generated nine factors accounting for 74% of the variance in the twenty-nine first-order factors. An examination of each factor generated in terms of the composition of the first order factor variables resulted in the definition of 6 factors with somewhat interpretable solutions.

After a review of the nine second-order factors it was decided to try a factor solution which accounted for approximately 60% of the variance. This solution generated five second-order factors. An analysis of these five factors concluded with what was thought to be meaningful definitions of each factor.

Factor I accounts for 14% of the variance in the total set of 29 factor scores. Six factor scores were identified with high factor loadings (Table 32).

An examination of the specific tables listed after each variable description will provide a listing of the variables that constitute the descriptor given to the second-order factor. The negative loadings on variables 1 and 5 along with the complete negative loadings on the first order variables means that there is a "concern for topic" as well as "teacher supportive behaviors." Variables 6, 14, 19 and 24 all relate to some form of encouragement of interaction. A teacher's use of supportive behaviors can also be descriptive of encouraging interaction. The fact that "student initiation" loads on this factor is another indication of encouragement occuring in the classroom.

The second factor generated from the twenty-nine first-order factors accounted for 13% of the variance. Table 33 presents the six variables loading high on Factor II.

Each of the factor variables identified as high in this second-order factor analysis relate most directly to some form of inappropriate behaviors which in some way are reacted to or were initiated in

TABLE 32

Factor I - Teacher encouragement of content-oriented interaction

Variable number	Variable description	Factor loading
1	Concern for topic Simon, Factor I (Table 28)	-.627
5	Teacher supportive behavior Flanders, Factor I (Table 17)	-.528
6	Student initiation Flanders, Factor II (Table 18)	.585
14	Teacher encouragement of content oriented interaction Ober, Factor I (Table 7)	.824
19	Teacher encouraging elaboration Medley, Factor I (Table 24)	.734
24	Problem solving behavior Withall, Factor II (Table 3)	.713

"negative" sense. The positive loading variables when examined in terms of their composition relate to the original observation variables of "laughter," "hostile," as well as "permissive" and "rebuking" behaviors. In the first order factors these variables loaded negatively and were interpreted as criticism or lack of criticism and teacher directive or non-directiveness (managing behaviors). Both of these high positive loading variables add to a conceptual meaning for this factor of "negativism."

(The variables that generated the first order factors for Simon, Factor 4 and Medley, Factor 3 were not easily interpreted. The definitions of these first-order factors may be inappropriate based on the loadings of the second order.)

By interpreting the second-order factor variables as they are stated and changing the conceptual interpretation of variable 4 and 21, it seems most reasonable to call this factor a dimension of negativism.

Factor III accounts for 10% of the variance in the total set of 29 variables. Each high loading first order factor variable is presented in Table 34 along with the first order factor descriptors and factor loadings.

TABLE 33

Factor II - Negativism

Variable number	Variable description	Factor loading
10	Chastisement: Aschner-Gallagher, Factor II (Table 13)	-.629
29	Discipline: Hough, Factor III (Table 23)	-.827
26	Teacher disapproval or dominance: Withall, Factor 4 (Table 5)	-.540
15	Student-teacher modification of inappropriate behaviors: Ober, Factor 2 (Table 8)	-.807
4	Criticism: Simon, Factor 4 (Table 31)	.821
21	Teacher authoritarianism: Medley, Factor 3 (Table 26)	.609

TABLE 34

Factor III - Teacher directing the communication process

Variable number	Variable description	Factor loading
5	Teacher supportive behaviors: Flanders, Factor I (Table 17)	-.597
20	Student initiation: Medley Factor II (Table 29)	-.669
23	Directing the communication process: Withall Factor I, (Table 2)	.764
29	Teacher substantive interaction: Hough, Factor II (Table 22)	.702

These first-order factor variables constitute what might be descriptive of a teacher directive dimension in the classroom. The high negative loading on variable 5 indicates that the teacher is not using supportive behaviors. These behaviors are described by the Flanders System as accepting student ideas and building upon them as well as asking questions and getting expected responses from the students.

Variable 20 also had a high negative factor loading which implies that student initiation does not occur in this factor. The combination of no student initiation and no teacher supportive behaviors is indicative of a somewhat teacher oriented dimension.

The remaining two variables (23 and 29) are directly related to the teacher "directing the communication process", and dealing with substantive material. The first two variables (5 and 20) reflect the lack of student involvement and teacher support while the second two variables (23 and 29) likewise support the dimension's description as Teacher directing the communication process.

The fourth second-order factor generated from the 29 variables accounted for an additional 8% of the variance in the set of scores. Table 35 presents the 6 variables loading on this factor.

TABLE 35

Factor IV - Teacher non-supportive behaviors

Variable number	Variable description	Factor loading
3	Neutral assertion: Simon Factor III (Table 30)	.601
8	Teacher rejection of student ideas: Flanders Factor IV (Table 20)	.644
18	Student-teacher warmth and acceptance: Ober Factor V (Table 11)	-.687
22	Teacher control of interaction: Medley Factor IV (Table 27)	-.552
25	Learner supportive behaviors: Withall Factor III (Table 4)	-.390
27	Teacher and student managerial: Hough, Factor I (Table 21)	.700

Variable numbers 3, 8, and 27 represent a non-supportive nature in the classroom. They are more concerned with managing the classroom

processes, teacher rejection of student ideas or those variables related to "quiet" and non-directing environment. The inverse of variables 18, 22, and 25 likewise refer to non-supportive behaviors, namely, a lack of "warming" classroom climate (Ober, Factor V), teacher "lecturing" (Medley, Factor IV), and the failure to exhibit "positive feelings" while associated with "giving opinions" (Withall, Factor III). It seems reasonable to define this dimension as the lack of supportive behaviors in the environment or "Teacher non-supportive behaviors."

Factor V is descriptive of the teacher monitoring classroom activities. This factor accounts for 7% or the variance in the total set of 29 first-order factor variables. Table 36 presents the two variables loading high on this second-order factor along with their descriptions and factor loadings.

TABLE 36

Factor V - Teacher monitoring (little verbal interaction)

Variable number	Variable description	Factor loading
7	Teacher monitoring: Flanders, Factor III (Table 19)	.811
17	Teacher directing: Ober, Factor IV (Table 10)	.910

An examination of the variables that compose the first-order factors described by variable 7 and 17 above indicates that in this dimension there is a great deal of silence or confusion along with the teacher directing and praising. Student initiation does not contribute to this factor; nor does teacher lecture. The combination of the variables that make up these two second-order factors constitute what might best be described as "Teacher monitoring."

DISCUSSION

The following is a discussion of results from the second order factor analysis relative to the problem under consideration. In addition to descriptions and discussion, several implications are noted.

The second order factor solution (Table 37) has identified five dimensions of classroom interaction which are measured by the seven observation systems. The five dimensions include some of the areas reported by Simon and Boyer as being the principal domains or foci of the various systems. However, part of Simon and Boyer's reporting is not substantiated by the factor solution.

The two principal domains or foci into which authors categorize their observation systems are the affective and cognitive domains. These are regarded as principal domains because the majority of systems are classified into one or both of these domains. Clear evidence of the affective domain appears in two of the second order factors, factor I and factor IV. Factor I, described as Teacher encouragement of content oriented interaction, specifically mentions positive affective behavior, i.e., encouragement. Factor IV, described as teacher non-supportive behaviors is composed of negative affective behaviors. These two factors were formed by comparing those variables which loaded high in relation to the respective factors. Flanders, Hough, Medley, Simon and Agazarian, Ober, and Withall had characterized their systems as measurements of the affective dimensions of classroom interaction. Variables from each of these systems loaded high in relation to each of these affective factors. Therefore, this second order factor analysis did offer evidence that the classification of these systems as having affective domains is accurate.

In contrast, no dimension for cognitive behaviors resulted from the second order factor analysis. Simon and Boyer had specified Aschner and Gallagher's system, OScAR 5V, SAVI and Withall's system as having cognitive foci. However, there is no one factor which could be described as cognitive centered. A second order factor analysis did not generate the domain which was reported as cognitive. Simon and Boyer (1970) have indicated that the distinction between affective and cognitive systems is vague. The second order factor analysis solution indicates that there is not a common cognitive dimension being measured by these systems.

In addition, this second order factor analysis did not generate any dimensions which could be identified as the psychomotor, activity, content, sociological structure or physical environment domains conceptualized by the respective authors. It is possible that these dimensions were not generated because of the homogeneity of class material, namely seventh and eighth grade science classes. However, the results from Gess (1968) and Soar (1966) indicated the importance of controlling for grade level. So it was decided to eliminate extremely heterogeneous data from consideration and focus instead

TABLE 37

Second-Order Rotated Factor Matrix

Variable	I	II	III	IV	V	
1	-.627*	.091	-.232	.118	-.042	
2	.384	-.076	.199	-.002	-.439	Simon
3	.159	.233	-.021	.601*	.348	
4	.005	.821*	.155	-.157	-.107	
5	-.568*	-.130	-.597*	.026	.291	
6	.585*	-.173	-.372	-.309	-.030	Flanders
7	.260	-.104	.145	.049	.811*	
8	.140	-.114	-.170	.644*	.001	
9	.070	.208	-.499	.078	-.114	
10	.085	-.629*	-.191	-.092	-.036	
11	-.227	-.058	-.209	.121	-.174	Aschner-
12	.128	.171	.347	.084	-.252	Gallagher
13	.318	-.317	.244	.133	-.013	
14	.824*	-.007	.169	-.068	.119	
15	.030	-.807*	.016	-.042	-.076	
16	.324	.119	-.107	.190	.083	Ober
17	-.141	-.074	.087	.003	.910*	
18	.134	-.082	-.056	-.687*	-.009	
19	.734*	.002	-.211	.083	-.135	
20	-.807	-.087	-.669	-.279	.385	Medley
21	-.047	.609*	.017	.017	.002	
22	.281	-.089	.488	-.552*	.343	
23	.106	.061	.764*	-.221	.213	
24	.713*	-.169	.097	.342	-.221	Withall
25	.178	.314	-.034	-.390*	-.388	
26	-.006	-.540*	-.023	-.317	.351	
27	.073	-.014	-.041	.700*	-.115	
28	-.069	.077	.702*	-.098	.062	Hough
29	-.076	-.827*	.191	.011	.152	

FACTOR DESCRIPTORS

I Teacher encouragement of content oriented interaction
II Negativism (recognition of inappropriate behaviors)
III Teacher directing the communication process
IV Teacher non-supportive behaviors
V Teacher monitoring (little verbal interaction)

* Factor loadings presented in Table 32 through 36.

only upon beginning science teachers of grades seven and eight.

Three different factors emerged from a comparison of the seven classroom observation systems. Although our data is not sufficient to identify these three factors as new domains by which to classify all observation systems, these three factors indicate dimensions which are common to the observation systems studied.

Variables from six out of the seven systems load high in relation to factor II. This indicates that a dimension of negativism or recognition of inappropriate behaviors is commonly measured by the observation systems. Factor III (teacher directing the communication process) contains high loadings from five out of the sever systems. Factor V highlights additional overlapping measurements. According to Factor V, three out of the seven systems focus on teacher monitoring behaviors.

In general, this means that the systems chosen do measure many of the same dimensions. Specifically this information should be of interest to researchers and supervisory personnel because the various instances of overlap provide a means for comparing measurements from one observation system with measurements from other systems.

Table 38 provides the communality figures for each of the variables. Each figure represents the amount of factor variance which each variable shares with the other variables. The communality ranges from .144 to .859. A perusal of this table will explain some of the overlapping which occurred in the second order factor analysis.

Variables from most systems have a great deal of common variance. Variables from Aschner-Gallagher's observation system share a consistently low amount of variance with the other variables. Consequently three of the variables from Aschner-Gallagher's system are not included in the previous discussion of second order factors. Variables 11, 12, and 13 simply do not load high enough in relation to any factor (see Table 37, Second-Order Rotated Matrix). Three possible explanations for this low communality follow. First it is possible that the reliability of the coder is questionable. This would mean that we are not seeing a true use of the Aschner-Gallagher system. Or secondly, it is possible that the homogeneity of the data used does not allow the full spectrum of Aschner-Gallagher categories to be utilized. A third alternative is that the Aschner-Gallagher system is the most unique system of any included in this study. That is, the other six systems contain a great deal of overlap. The Aschner-Gallagher system measures behaviors which may form one or more dimensions not common to the other systems. Therefore, most of the system (three out of five variables) stays independent of any factor.

One of the original intents of this study was to deal with the proliferation of category systems. This attempt at examining the overlap in behavioral category systems was successful in that it demonstrates that at least seven category systems have very similar or overlapping dimensions. The fact that each factor has at least

TABLE 38

SECOND-ORDER FACTOR ANALYSIS COMMUNALITIES

Variable	
1'	0.470603
2	0.384843
3	0.562820
4	0.734593
5	0.780338
6	0.606392
7	0.760350
8	0.475627
9	0.317406
10	0.448475
11	0.143623
12	0.236814
13	0.278619
14	0.726009
15	0.660313
16	0.173097
17	0.859430
18	0.499402
19	0.607747
20	0.688254
21	0.378688
22	0.746651
23	0.692542
24	0.712576
25	0.427141
26	0.515712
27	0.510244
28	0.516563
29	0.748851

one second-order factor loading per category system is an indication of the similarity of dimensions across category systems.

This overlap of dimensions among the category systems raises questions about the continual unsystematic development of observation schemes. By operationalizing the same behavioral dimensions under different titles the developers of these category systems add to the proliferation problem and in so doing make the process of studying teaching more difficult. There are so many different categories of interaction and specification of behaviors that it becomes almost, if not totally, impossible to interrelate results of studies that employ different category systems.

The problem that exists in relating research using different observation systems was addressed by this study. In the past a researcher who found "significant" relationships between observed variables and other measures of performance could only intuitively relate his results with findings from other research using category systems. This study permits the researcher to examine the second and first order factors to determine if the dimensions intended to be studied overlap with existing research data employing other observation systems. For example, if one employed the identified Flanders dimension of "Teacher supportive behaviors" in a study of student achievement, studies using Medley's dimension of "Teacher encouraging elaboration" would relate directly to the Flanders dimension.

As was indicated earlier in this report, confidence in research on teaching requires replication. Taking that as a given, it seems appropriate to use the data and findings of this study, namely the second-order factor matrix, to relate studies using observational systems to each other. The time and energy expended on independent studies of classroom behavior requires that we examine them in light of their own outcomes as well as conclusions from other studies using different systems.

Since this effort was described as a pilot study to explore the implications of doing additional factor analytic work with observation systems it seems reasonable to suggest the following strategy. Before further factor analyses are performed on additional behavioral category systems, a review of research studies using the systems employed in this study should be completed. This review of research should attempt to use the overlapping factor dimensions identified across category systems to compare the outcomes of studies using each category system. The intent of this review would be to determine whether these factors permit valid cross-referencing of findings.

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APPENDICES

A. a. Withall
   b. Ober
   c. Aschner-Gallagher
   d. Flanders
   e. Hough
   f. OScAR 5V
   g. Simon and Agazarian

B. Explanation for Coding tapes
   Sample of variable coding sheet

WITHALL: SOCIAL-EMOTIONAL CLIMATE INDEX

Each teacher-statement contains one of two dominant kinds of intent. These are:

either a) intent to sustain the teacher and his behavior (teacher-centered statements)

or b) intent to sustain the learner and his behavior (learner-centered statements and issue-centered statements are included under this intent).

By analysis of both the CONTEXT and the CONTENT of a teacher statement it may be possible to determine whether the dominant intent of a statement is to sustain the teacher or the learner.

Once the dominant intent of a teacher-statement has been ascertained, one can proceed to determine the technique by which the support is conveyed.

1. If the statement is intended primarily to sustain the teacher, one or possibly a combination of the two following techniques may be used:

   a) reproof of the learner (category 6)
   b) directing or advising the learner (category 5).

   Frequently the intent of the statement is to sustain the teacher yet neither of the above techniques is used. In that event the statement is simply a self-supportive remark which defends the teacher or evidences perseveration in support of the teacher's position or ideas. (category 7).

2. If the intent of a statement is to sustain the learner then one or possibly a combination of the two following techniques may be used:

   a) clarification and acceptance of the learner's feelings or ideas (category 2),
   b) problem-structuring statements (category 3).

   Frequently the intent of a statement is to sustain the learner yet neither of the above techniques is used. In that event the statement is simply one that reassures, commends, agrees with or otherwise sustains the learner (category 1).

Infrequently a teacher-statement may have no dominant intent to sustain

either the teacher or the learner. If the statement represents neither of the techniques in the two intent areas nor gives evidence of being one of the more general kinds of supporting statements, then the statement can be considered to have no intent to support and should be placed in category 4.

Recourse to the learner-statement or behavior before and after a teacher response, particularly when one encounters a statement in which the intent is difficult to ascertain, is sometimes helpful in categorizing the teacher's statements.

VARIABLES GENERATED BY CODER FOR CLASSROOM COMMUNICATION OBSERVATIONAL CATEGORIES

1. Asks for information
2. Seeks or accepts direction
3. Asks for opinion or analysis
4. Listens
5. Gives information
6. Gives suggestions
7. Gives directions
8. Gives opinions
9. Gives analysis
10. Shows positive feeling
11. Inhibits communication
12. Shows negative feeling
13. No communication
14. Perfunctory agreement or disagreement

OBER - THE RECIPROCAL CATEGORY SYSTEM (RCS)

The Reciprocal Category System (RCS) attempts to measure the affective dimension of classroom interaction. There are nine types or categories for student talk and a similar nine categories for teacher talk.

Variables for the first order factor analysis were the eighteen categories just mentioned, a category for silence or confusion and a category for the percent of teacher talk. These twenty variables follow.

1. Teacher "warms" (informalizes) the climate
2. Teacher accepts behavior of another
3. Teacher amplifies the contributions of another
4. Teacher elicits information
5. Teacher responds
6. Teacher initiates (provides information or opinions)
7. Teacher directs
8. Teacher corrects
9. Teacher "cools" (formalizes) the climate
10. Silence or confusion
11. Student "warms" (informalizes) the climate
12. Student accepts behavior of another
13. Student amplifies the contributions of another
14. Student elicits information
15. Student responds
16. Student initiates (provides information or opinions)
17. Student directs
18. Student corrects
19. Student "cools" (formalizes) the climate
20. Teacher talk (percent)

ASCHNER-GALLAGHER SYSTEM

The Aschner-Gallagher classroom observation attempts to categorize cognitive, procedure and activity dimensions of interaction. In particular this system studies thought processes which occur in the classroom by analyzing the types of questions being asked in the classroom.

There are five major categories for this system.

1. Routine procedures
2. Cognitive-memory operations
3. Convergent thinking
4. Evaluative thinking
5. Divergent thinking

Forty-seven sub-categories are used to describe these categories.

Variables generated by the coder for the Aschner-Gallagher System follow. These are twenty-nine sub-categories which did occur in the fifty taped lessons used for this study.

1. Question
2. Procedure
3. Aside
4. Nose-counting
5. Feedback
6. Self-structuring
7. Structuring others
8. Future structuring
9. Class structuring
10. Positive verdict on academic performance
11. Negative verdict on academic performance
12. Acceptance of content (agreement)
13. Rejection of content
14. Dunno
15. Muddled
16. Humor
17. Scribe
18. Repetition
19. Review
20. Clarifying meaning
21. Clarifying qualification
22. Fact stating
23. Fact detailing
24. Factual monologue
25. Rational explanation
26. Value explanation
27. Narrative explanation
28. Generalization conclusion
29. Summary conclusion

FLANDERS SYSTEM OF INTERACTION ANALYSIS

Variable Dictionary

Variable Number	Variable Name and Description
101 = 1	Percent student talk (columns 8 and 9)
102 = 2	Percent teacher talk (columns 1 through 7)
103 = 3	Revised indirect-direct ratio (columns 1-3 over columns 6 and 7) - TT13/TT67
104 = 4	Big indirect-direct ratio (columns 1-4 over columns 5-7) - TT14/TT57
105 = 5	Revised indirect-direct row 8, column 1-3 over row 8, column 6-7) - TT813/TT867
106 = 6	Big indirect-direct ratio row 8 (row 8, columns 1-4 over row 8, columns 5-7) - TT814/TT857
107 = 7	Revised indirect-direct row 9 (row 9, columns 1-3 over row 9, columns 6-7) - TT913/TT967
108 = 8	Big indirect-direct ratio row 9 (row 9, columns 1-4 over row 9, columns 5-7) - TT914/TT957
109 = 9	Revised indirect-direct ratio rows 8 and 9 (rows 8 and 9 columns 1-3 over rows 8 and 9 columns 6-7) RID89
110 = 10	Big indirect-direct ratio rows 8 and 9 (rows 8 and 9 columns 1-4 over rows 8 and 9 columns 5-7) - BID89
111 = 11	Extended indirect area (columns 1-3 of rows 1-3) - XIN
112 = 12	Extended direct area [cells (6,7)+(7,7)+(7,6)+(6,6)] - XDI
113 = 13	Extended indirect-direct ratio (variable 111 over 112) - EXIND
114 = 14	The crux of the content cross [cells (4,5)+(5,5)+(5,4)+(4,4)] - CRUX
118 = 15	Vicious circle-cells (6,6)+(6,7)+(7,7)+(7,6)+(6,10)+(7,10) - CRL67
119 = 16	Study-state cells. Sum of cells on the diagonal of the matrix - SS17
120 = 17	Extended student talk [cell (8,8)+(8,9)+(9,9)+(9,8)] - EXTST

THE FOLLOWING VARIABLES ARE THE COLUMN TOTALS AS DISPLAYED IN THE MATRIX

121 = 18	Column one - accepting student feelings
122 = 19	Column two - praise
123 = 20	Column three - accepting student ideas
124 = 21	Column four - asking questions
125 = 22	Column five - lecture
126 = 23	Column six - giving directions
127 = 24	Column seven - criticizing
128 = 25	Column eight - student talk response
129 = 26	Column nine - student talk initiation
130 = 27	Column ten - silence or confusion

132 = 28 Student initiation after teacher lecture - five - nine cell - C59

134 = 29 Ratio of extended three's to the total number of three's - EX33

135 = 30 Ratio of extended three's to total student talk - EX33F

136 = 31 The number of sevens - column seven - seven, seven cell - AMT7

137 = 32 The number of nines, column nine - nine, nine cell - AM59

138 = 33 The number of ten's - column ten - ten, ten cell - AMT10

139 = 34 The number of two's - column two - two, two cell - AMT2

140 = 35 Questions asked followed by silence or confusion - four, ten cell - C410

141 = 36 Extended lecture - five, five cell - C55

142 = 37 Extended student initiation - nine, nine cell - C99

143 = 38 The number of questions asked column four - four-four cell - AMT4

144 = 39 Flexibility as defined by George L. Miller 4209 U.H.S., University of Michigan - FLEXM

145 = 40 The number of directions - column six - six, six cell - AMT6

146 = 41 The number of times a teacher accepts student's ideas - column three - three, three cell - AMT3

NOTE: THE PRECEDING LIST OF VARIABLES SHOULD BE INTERPRETED WITH CAUTION. AN UNDERSTANDING OF WHAT THE CATEGORIES ARE AND HOW THE MATRIX WORKS SHOULD BE ACQUIRED BEFORE ANY INTERPRETATION IS ATTEMPTED.

HOUGH SYSTEM FOR CLASSROOM OBSERVATION

The following are the variable descriptors for each of the twenty-seven variables calculated from the Hough System.

1. Teacher direct substantive
2. Teacher direct managerial
3. Student direct substantive
4. Student direct managerial
5. Teacher interactive substantive
6. Teacher interactive managerial
7. Student interactive substantive
8. Student interactive managerial
9. Static or noise
10. I/D ratio
11. i/d ratio
12. Student I/D ratio
13. Student i/d ratio
14. I/D in teacher response
15. i/d in teacher response
16. I/D in student response
17. i/d in student response
18. Ratio of negative to positive appraisal
19. Teacher knowledge/personal appraisal
20. Teacher acceptance/other appraisal
21. Total student/total teacher
22. Substantive response/initiatory behavior in teacher response
23. Substantive response/initiatory behavior in student response
24. Teacher substantive/managerial
25. Appraisal/non-appraisal in teacher response
26. Student substantive/managerial
27. Total substantive/managerial

OScAR 5V OBSERVATION SYSTEM

The eight keys scored on OScAR 5V were empirically derived by factor analysis, and represent approximations to orthogonal factors. (The approximations result from simplification of the factor weights.)

In addition to being roughly orthogonal in a factor-analysis sense, the keys are also orthogonal in the sense of orthogonal contrasts in the analysis of variance. This means that they are experimentally independent, or non-overlapping in the same sense that separate behavior categories are non-overlapping. This should eliminate any spurious intercorrelations between keys such as Q, A, S, and D that share certain categories in common

One result of this is that some keys are bipolar, that is, contrast two distinct behavior patterns seen as opposite. Keys Q, D, S, and A are of this type. Keys M, R, P, and L are independent because they do not share items with other keys.

In order to remove differences in total numbers of events recorded in different records, each category frequency may be divided by the total number of events on the record, and so reduced to a proportion independent of record length. To save work, this may be done after the scores are computed instead of before.

A brief description of each key follows.

M (Managing Behaviors). This is basically an index of the relative number of events that are concerned with procedural matters--with "managing" the class. Teacher statements which tell pupils to do (or not to do) something or which describe procedure are counted.

The factor analysis detected the fact that many teachers formulate commands in such a way that they appear on the surface to be requests. "Will you please turn to page 125?" "Would you mind closing the door?" Such utterances as these are coded as Considering on OScAR 5V, even though pupils respond to them as Directing. Hence, Initial Considering statements have a weight of +1 on M. However, Continuing Considering statements have a weight of -1. When two or more considering statements are made by the teacher in a row, the apparent consideration is much more likely to be perceived by pupils as genuine. A "really" considerate teacher tends to emit more Continuing Considering statements than Initiating ones, and the net effect on his M score is negative.

R (Rebuking Behaviors). This reflects primarily how often a teacher criticizes pupil behavior. Since Initiating Rebukes are weighted three times as heavily as Continuing ones, a high score does not refelct hostility so much as irritability, perhaps.

P (Permissive Behavior). A teacher gets a point on this key every time he offers a pupil a choice of courses of action, and loses one each time he refuses a pupil such a choice when the pupil requests it. The score, which is bipolar, contrasts "permissive" teachers (ones who let pupils make decisions) with "autocratic" ones (who do not).

L (Listening Behavior) A teacher earns a point on this scale each time he lets a pupil who has just volunteered a comment or question make

a second comment without interrupting him. A high-scoring teacher is one who "listens" to a pupil and waits to be sure the pupil is done talking before replying or interrupting.

A (Lecturing Behavior) This key contrasts the teacher who develops content by lecturing from the one who develops it by questioning pupils. It is the first of four keys which describe a teacher's questioning style.

Each time a teacher asks a question, he gets one negative point on the key. Each time he starts to give information himself, he gets a positive point. Each time he goes ahead to make another informing statement after he has already made one, he gets three positive points. A teacher who lectures--talks about content for long periods--gets a very high positive A-score; one who interacts a lot with pupils gets a high negative one.

S (Question Source). This key contrasts classrooms where pupils initiate relatively more interchanges with classrooms where the teacher initiates relatively more of them. It is sensitive only to interchanges that are supported, acknowledged, or rejected. The highest positive score goes to a teacher whose pupils initiate many interchanges and who acknowledges the initiations without evaluating them; the lowest to the one who asks a lot of questions and acknowledges pupils' responses without evaluating them.

D (Question Difficulty). This key is the most complex of the eight; it seems to contrast two kinds of teachers. A high positive score identifies a teacher who asks many questions, mostly convergent, which appear to be easy since the pupils almost always answer them correctly; but are rarely praised (as they should be if the questions are difficult). A high negative score identifies a teacher whose questions elicit answers of more varied quality--some are praised, some criticized, some naturally rejected, etc., but very few are merely approved.

Q (Question Quality) This key also contrasts two kinds of teacher. One teacher (the high positive) asks mainly elaborating questions (ones asking a pupil to enlarge on or react to a previous comment), and rarely evaluates a pupil response. (Presumably he asks a pupil to do so.) The other (high negative) asks mainly convergent questions, and either approves the pupil's response, criticizes it, or (more likely) acknowledges it and asks another question of another pupil.

The first teacher, then, is probing, questioning to develop more subtle points; the second is conducting a rapid-fire drill.

Dr. D. Medley

SIMON AND AGAZARIAN CATEGORY SYSTEM

SAVI Category System Definitions

1. SD — SELF DEFENSE - Negative criticism or apology for self; self denigration
2. H — HOSTILE - Negative criticism of others, of objects, direct verbal attack, sarcastic opinions and questions. Attacking questions, indignant questions directly denigrating a person.
3. EV — EVERYBODY OUGHT - Dogmatic value judgments that imply general prescriptions of what everybody ought to know or what everybody ought to be doing.
4. I — INTELLECTUALIZATION - Analysis of a problem in purely intellectual terms to the neglect or exclusion of feelings or practical considerations. Jargon that is not shared by the group.
5. DJ — DEFENSIVE JOKE - Jokes made at the expense of a person, self, or the work.
6. PS — PERSONAL SHARING - Personal information about likes, dislikes, happenings or events that are "close" to the person; personal descriptions of "how I feel - what I want" in relation to the topic or task.
7. DE — DESCRIPTION - Description of condition of objects, activities, behaviors, or thinking.
8. TQ — TOPIC QUESTIONS - Questions of a non-personal nature.
9. TJ — TOPIC JOKE - Something said to provoke laughter; jests, puns, about the topic at hand or the situation in which the discussion is taking place. Non-defensive, non-maintenance. Does not include anecdotes from personal life.
10. PR — POSITIVE REINFORCEMENT - Agreement. Gives encouragement for speaker to continue along his same line of conversation, but gives no other information than the listener has heard the message and agrees.
11. NR — NEGATIVE REINFORCEMENT - Disagreement. Tends to discourage the discussed topic and tends to change the direction of the conversation away from the subject discussed or to channel it in a different direction.
12. O — OPINION - Conclusions unsupported by facts. Judgments, appraisals, interpretations, speculations, assumptions about a topic. Implies a conclusion, voiced without making explicit the basis from which it was derived.
13. Q — QUIET - Silence in the group.
14. N — NOISE - More than one person speaking in the group. Too much noise for the coder to hear what is happening.
15. L — LAUGHTER - Laughter by members of the group.

16. P PROPOSAL - The act of putting forward or stating something for consideration. Influence attempts.

17. CO COMMAND - To order or direct another's behavio

18. MS MAINTENANCE SUPPORT - To strengthen by additional assistance, material or support. Remarks that emotionally support a person and inform him the "MS speaker" understands how the listener feels

19. SA SELF AFFIRMING - Statements of a self-declarative and self-affirming nature supporting one's stand or one's self without being defensive or hostile.

20. MJ MAINTENANCE JOKE - Something said or done to provoke laughter. Maintenance jokes are good-natured jests supporting another person or the group. They are non-defensive, non-hostile, non-critical.

21. RN RESPONSE NARROW - Answers to questions which are right or wrong, or to which there is only one answer or a limited number of answers. Factual answers.

22. RB RESPONSE BROAD - Answers to questions which require a person to state an opinion, make inferences, make an evaluation, state a relationship between facts or sets of facts; answers to questions to which there are no right or wrong answers (evaluative or divergent question)

23. TC TOPIC CLARIFICATION - Clarification, expansion, or enlargement of subject material being worked with immediately.

24. TB TOPIC BUILD - To build on, or add to, another's idea. Immediate addition of a new and very closely related idea to one just mentioned. Agreement with the person's thought is implied.

25. TR TOPIC REFLECTION - Quotation or paraphrase of something said within the group. Indicates to the group that the speaker has attempted to hear the original message. In tallying, accuracy of the statement is not judged; it is the attempt, not the content that is tallied.

EXPLANATION FOR CODING TAPES:

1. Enclosed are forms to be used for listing variables calculated from the coding of each tape recorded lesson. Indicate at the top of each column the names applied to each calculated variable. After listening to and coding each lesson, place the value for each variable in the appropriate cell.

2. On a separate sheet of paper indicate the method used to calculate each variable listed at the top of the columns.

3. Please forward to us:

   a. The variable coding sheet;

   b. The explanation for calculating variables; and

   c. The raw data used to compute variable values.

We appreciate your coding this material and in addition to your check which will be forwarded to you upon receipt of these data, you may keep the cassette tapes for your own use.

Thank you for your cooperation and assistance.

The diagram provided below is a pictorial representation of the actual forms sent to each of the coders employed in this study.

VARIABLES GENERALLY CALCULATED FROM:_____

(List variable names across tops of columns)

TAPE #'s					
Lesson 1					
Lesson 2					
Lesson 3					
. . . .					
Lesson 50					